Among 1815 randomly selected high school students surveyed by the Centers for Disease Control, 417 said they were current smokers.

a) Find the sample proportion p-hat. $\hat{p}$ $SE(\hat{p})$

b) Estimate the variability in such sample proportions by finding SE(p-hat).

c) Is it appropriate to use a Normal model to describe the sampling distribution of p-hat? Check the appropriate assumptions and conditions.

d) Find the margin of error for a 95% confidence interval.

e) Interpret the 95% confidence interval in this context.

a) $\hat{p} = \frac{\#\text{ smokers}}{\#\text{ sample}} = \frac{417}{1815} = 0.23$

b) $\hat{p} + \hat{q} = 1$

$\hat{q} = 1 - \hat{p} = 1 - 0.23 = 0.77$

$SE(\hat{p}) = \sqrt{\frac{\hat{p}\hat{q}}{n}}$

$= \sqrt{\frac{(0.23)(0.77)}{1815}}$

$= 0.01$

$\hat{p} \to$ proportion of "yes"

$\hat{q} \to$ proportion of "no"

$n \to$ sample size (total)

c) Independence: Yes

Randomization: Yes

10% Condition: Yes

Success/Failure Condition:

$n\hat{p} > 10$ $n\hat{q} > 10$

$(1815)(.23) > 10$ $(1815)(.77) > 10$

$417 > 10$ $1398 > 10$

Yes Yes

d) 95% Confidence Interval

$\hat{p} \pm 2(SE)$

$0.23 \pm 2(0.01)$

0.23 ± 0.02

$(0.21, 0.25)$

e) We are 95% confident that between 21% and 25% of high school students smoke.

Rutgers University surveyed 4500 randomly selected high school students nationwide; 3329 of these students admitted they had cheated on a test at least once.

a) Find the sample proportion p-hat.

b) Estimate the variability in such sample proportions by finding SE(p-hat).

c) Is it appropriate to use a Normal model to describe the sampling distribution of p-hat? Check the appropriate assumptions and conditions.

d) Find the margin of error for a 95% confidence interval.

e) Interpret the 95% confidence interval in this context.

a) $\hat{p} = \frac{3329}{4500} = 0.74$

b) $SE(\hat{p}) = \sqrt{\frac{\hat{p}\hat{q}}{n}}$

$= \sqrt{\frac{(0.74)(0.26)}{4500}}$

$= 0.01$

c) Independent: Yes

Random: Yes

10% Condition: Yes

$(4500)(10) = 45000$

are there more than 45000 h.s. students in the U.S.? Yes

Success/Failure:

$n\hat{p} > 10$ $\quad$ $n\hat{q} > 10$

$(4500)(.74) > 10$ $\quad$ $(4500)(.26) > 10$

$3329 > 10$ $\quad$ $1170 > 10$

Yes $\quad$ Yes

d) 95% confidence interval:

$\hat{p} \pm 2(SE)$

$0.74 \pm 2(0.01)$

0.74 ± 0.02

$(0.72, 0.76)$

e) We are 95% confident that between 72% and 76% of high school students have cheated at least once.

A traffic safety study mounted a radar gun along a section of rural interstate highway where traffic was moving smoothly, and found that 243 out of 355 cars were exceeding the posted speed limit by at least 5 miles per hour.

a) Find the sample proportion p-hat.

b) Estimate the variability in such sample proportions by finding SE(p-hat).

c) Is it appropriate to use a Normal model to describe the sampling distribution of p-hat? Check the appropriate assumptions and conditions.

d) Find the margin of error for a 95% confidence interval.

e) Interpret the 95% confidence interval in this context.

a) $\hat{p} = \frac{243}{355} = 0.68$

b) $SE = \sqrt{\frac{\hat{p}\hat{q}}{n}}$

$= \sqrt{\frac{(0.68)(0.32)}{355}}$

$= 0.025$

c) Independence? Yes

Random? Yes

10% Condition? $(355)(10) = 3550$
Yes

Success/Failure:

$n\hat{p} > 10$ $n\hat{q} > 10$

$(355)(0.68) > 10$ $(355)(0.32) > 10$

$243 > 10$ $112 > 10$

Yes Yes

d) 95% confidence interval:

$\hat{p} \pm 2(SE)$

$0.68 \pm 2(0.025)$

0.68 ± 0.05

$(0.63, 0.73)$

e) We are 95% confident that between 63% and 73% of cars on the road are speeding.